



# Characterization and expression analysis of somatic embryogenesis receptor-like kinase genes from *Phalaenopsis*

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**ABSTRACT.** Somatic embryogenesis receptor-like kinase (*SERK*) genes have been found to be involved in the somatic embryogenesis of several plant species. We identified and characterized 5 *PhSERK* genes in the *Phalaenopsis* orchid. The amino acid sequences of PhSERKs and other SERK proteins are highly conserved, with the highest homology observed in the leucine-rich repeat-receptor-like kinase domain. All 5 *PhSERKs* were expressed in all *Phalaenopsis* organs examined (root, leaf, shoot apical meristem, and flower), with the strongest expression, particularly for *PhSERK1* and 3, in the shoot apical meristem of mature plants. Expression of all PhSERKs was downregulated during early floral bud development and was upregulated gradually until the semi-open flower stage was reached. All 5 *PhSERKs* were expressed during both seed germination and protocorm-like-body (PLB) development. In germinated seeds, quantitative real-time PCR revealed upregulation of all *PhSERKs* except *PhSERK4* at 1 week and downregulation after 4 weeks. The 5 *PhSERKs* were differentially expressed in the early stage

of PLB development and maintained substantial levels during PLB formation, with PhSERK1 and 5 upregulated 1 week after culture and PhSERK2, 3, and 4 downregulated over this period. Because physical wounding of PLB stimulates secondary PLB formation, the *PhSERK5* expression peak at week 3 coincided with visible and fully developed secondary PLBs. *PhSERK5* may be important in PLB induction and subsequent development. Our *PhSERK* expression analysis revealed that these genes have a broad role during orchid plant development.

**Key words:** *Phalaenopsis*; Leucine-rich repeat-receptor-like kinases; *SERK*; Protocorm-like body